Storm of September 17–22, 1920.—This storm developed in the vicinity of the Swan Islands, moved north-northwestward with increasing intensity, but retaining its small diameter. It was prevented from making a normal recurve by high pressure to the northeast, and the increasing effect of this HIGH as it spread out toward the southwest caused a further shift of the storm's course toward the northwest. It passed inland on the Louisiana coast, where winds of hurricane force were reported, particularly on the right-hand side, where the isobaric gradients were increased by the proximity of the HIGH.

Storm of September 20–23, 1920.—This storm, which was nearly coincident with the preceding, developed off the South Atlantic coast in an area of low barometer which had stagnated there. No low barometer readings were recorded at Weather Bureau stations in the vicinity because of the extremely small diameter of the storm, but the lightship off Smiths Island, N. C., was dragged several miles from its station and a 72-mile wind was reported.

Storm of September 26–30, 1920.—The first evidences of this disturbance were noted on the morning of the 26th over the eastern Gulf of Mexico. Under the influence of a ridge of high pressure it was propelled slowly westward. On the 28th it came under the influence of a rapidly developing trough of low pressure, recurved, and moved rapidly northeast. But in crossing Florida it lost its identity as a hurricane, and on the morning of the 30th could not be separately identified in the general trough formation which covered the Atlantic coast region. This large and elongated disturbance developed into a severe coast storm, which should not, however, be confused with the original hurricane. In fact, there is some doubt whether the Gulf disturbance was ever a true hurricane. The heavy north winds which occurred over the Gulf on the 30th, long after the passage of the storm center, were due to the steep-pressure gradient formed as a great HIGH moved down from the northwest in the rear of the trough.

Storm of June 14–23, 1921.—This storm apparently developed over the western Caribbean Sea about the 14th and was carried northwestward by the general circulation, pressure being high over the eastern Gulf of Mexico and low over Mexico. This distribution of pressure continued until the 19th, the disturbance meanwhile crossing the Gulf of Honduras, the Yucatan Peninsula, and passing into the Gulf of Campeche. So far, heavy winds had occurred only on the right-hand side of the storm path, in the direction of the normal increase in pressure. No further reports from the vicinity of the storm were received until the late afternoon of the 21st, when special observations indicated its position some distance off the Rio Grande, and later reports showed a north-northwest movement and a fully developed hurricane. The storm center crossed the Texas coast line at Matagorda Bay and moved nearly due north over Palacios, Wharton, and Wallis, Tex., the last-named place being about 40 miles west of Houston, Tex., the nearest approach to a regular Weather Bureau station.

The three tropical storms during the period September 5–15, 1921.—From more complete reports which have since accumulated it appears that three important tropical storms were coexistent over southern waters during this period. A small disturbance made its appearance over the southwestern Gulf of Mexico on the 6th and passed inland near Tampico, Mex. The northward movement of the disturbance was evidenced by the torrential rains which fell over southern and central Texas between the 8th and 10th.

On the morning of the 8th a small but very severe hurricane made its appearance to the southeast of Barbados, crossed the Grenadines, moving northwest and with low pressure to the northward the storm turned in that direction, passed through the Mona Passage, and to the east of Turks Island during the 10th and 11th and crossed the Bermudas on the 15th with undiminished intensity.

On the 12th, when the preceding storm was central immediately northeast of Turks Island, the S. S. *Capillo* reported a hurricane of small diameter a short distance southeast of Bermuda. This storm has since been traced back (Tropical Hurricane of Sept. 5–15, 1921, by F. G. Tingley, in this issue, p. 674) and was found to be in existence as early as the 5th in approximate Lat. 22° N. and Long. 54° W. As shown by the accompanying chart, the storm moved slowly west-northwest, recurving near Lat. 27° N., Long. 67° W. These two storms attained great severity over the steamer lanes as they passed into higher latitudes.

Storm of October 20–28, 1921.—This was probably the most severe hurricane since the September storm of 1919. A disturbed condition was first noted to the southwest of Jamaica about the 20th. Then followed a very rapid development in area and intensity. Carried along slowly in the general circulation it passed near the Swan Islands, through the Yucatan Channel, and during the 24th, with high pressure breaking down in front and under the influence of a southwest current in the upper air, the hurricane recurved and on the morning of the 25th was centered immediately southwest of Tampa, Fla. A clear path was now apparently open to the northeast, but, meanwhile, a great HIGH was bearing down from the north and under its influence the storm, which had lost considerable intensity while crossing Florida, was forced to take a new path to the east-southeast and was last noted on the 28th south of Bermuda and still in the latitude of Tampa. Some very low barometric readings were made in the path of this hurricane, the schooner *Virginia* reporting 27.84 inches in the Yucatan Channel on the 23d, the S. S. *El Estero*, 27.84 inches at 10 p. m. of the 24th in the eastern Gulf and 28.12 inches at Tarpon Springs, Fla., at noon on the 25th.

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HAILSTORM IN ALABAMA, NOVEMBER 14, 1921.[1]

By P. H. SMYTHE, Meteorologist

[Weather Bureau, Montgomery, Ala., Jan. 7, 1922.]

The weather map on the morning of November 14, 1921, showed a slight barometric depression centered in extreme northeastern Texas, with a pressure gradient of about three-tenths of an inch from the center of the LOW to the south Atlantic coast. North of the LOW, pressure was only relatively high, with no well-defined crest. During the day the northeast-Texas depression filled considerably and the center of the high lying to the north drifted eastward to Missouri. The evening weather map on November 14, showed pressure to be nearly uniform east of the Rocky Mountains, with isotherms running almost east and west from the Rocky Mountains to the Alleghenies, and varying from freezing in the northern portions of Illinois, Indiana and Ohio, to 70° to 74° on the central and east Gulf coast. During the night of November 14, the HIGH increased somewhat in intensity

[1] See also Mo. Weather Rev., Sept. 1915, 43: 446–448 Fassig, O. L.: Remarkable fall of hail in Maryland. (Illustrated.)

became better defined, and centered in Indiana on the morning of November 15, while pressure in the Gulf and South Atlantic States also increased somewhat. The weather map on the morning of November 14th indicated conditions favorable for local thunderstorms in this section, and forecast was made accordingly. During the afternoon of November 14, thunderstorms, attended by light to heavy hail occurred in a strip of territory extending from Pickens County, Ala., southeastward across the State to Barbour County, Ala. The hailstones ranged from about the size of buckshot to as large as a baseball, the largest weighing as much as a pound. In the area mentioned the maximum temperatures for the day ranged between 73 and 83.

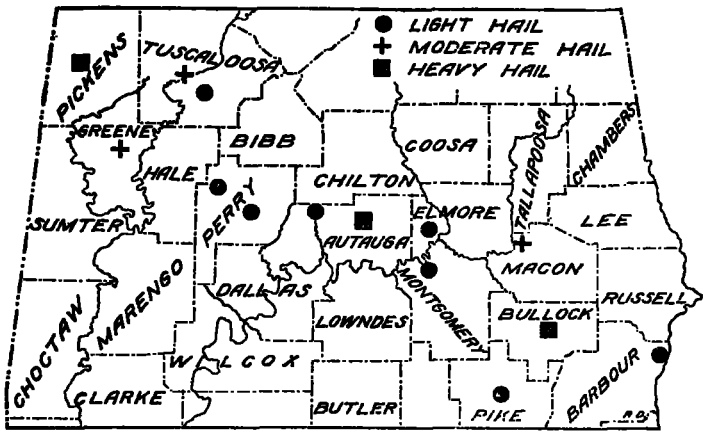

FIG. 1.—Portion of Alabama showing occurrence of hail-storms.

Material damage was done by the hailstones to paper roofing, windows, skylights, etc., and some poultry and live stock were killed, and a few persons slightly to badly injured. The damage was greatest in the vicinity of Reform, Pickens County; Vida, Autauga County, and Union Springs, Bullock County.

The following are extracts from a few of the reports received from correspondents:

Reform, Pickens County, Ala.—Montgomery (Ala.) Journal, Associated Press. Hailstones as large as baseballs and weighing a pound each in some instances, fell here late in the afternoon of the 14th. Damage estimated at $5,000 was done in this vicinity. In the mill village composition roofing was torn off houses and occupants in some instances had to move out. Thirty-two windows were broken out of the county high school.

Reform, Pickens County, Ala.—S. K. Dorroh's report: All the paper roofing in town is being repaired. A lot of the hailstones were as large as hen eggs.

Eutaw, Green County, Ala.—Correspondent's report: Three separate storms of hail about half hour apart; continuous rain from 2:30 p. m. to 4:30 p. m. Hail fell about 10 minutes each time. No damage except to roofing.

Tuscaloosa, Tuscaloosa County, Ala.—Mrs. Kate T. Willingham's report: Hailstorm came from northeast. Hail about the size of partridge eggs, approximately lasted 20 minutes. After a cessation of about 15 minutes stones came from due north, with hail stones as large as hen's eggs, largest weighing one fourth pound. After cessation of about 10 minutes storm came from northwest, with hail smaller than second storm and not so intense, but wind much stronger than other two storms. No damage except to glass.

Prattville, Autauga County, Ala.—Report to Montgomery Journal: The stones were so large and heavy glass windows were reported broken and limbs of trees were cut off. It was declared to be the most extraordinary hail in size ever seen here.

Mountain Creek, Chilton County, Ala.—Mr. J. T. Culpepper's report: Hail in balls, size from buckshot to larger than goose eggs, some weighing 1 pound or more. Gardens were damaged; also slight damage to fruit and other trees, and some stock slightly injured by hail.

Milstead, Macon County, Ala.—Mr. W. U. Wall's report: On November 14 Milstead was visited by a heavy hailstorm in which there were stones as large as hen's eggs; paper roofing was damaged, and in some instances window glass broken. Approximate amount of damage, $500.

Union Springs, Bullock County, Ala.—Mr. R. W. West's report: The writer viewed the unusual condition from the northeast, and indications pointed to extraordinary atmospheric conditions and without doubt an unusual windstorm, which may have reached proportions of a tornado. Others viewed very much the same conditions in southwest. Wind was not very strong, except at apparently a high altitude. The hailstones covered the ground, and were from 4 inches to 8 inches in circumference. The principal damage was to composition roofs, skylights, and window panes, all of which was done by hailstones.

Union Springs, Bullock County, Ala.—Mr. S. P. Rainer's report: It thundered, with lightning, all night. Some stock was killed. The ground was covered with hailstones. The stones were from 1 inch to 8 inches in circumference. It was the worst hailstorm I ever saw.

Union Springs, Bullock County, Ala.—Mr. P. L. Cowan's report: Very heavy hailstorm at 6:30 p. m., November 14. The largest hailstones measured 7 inches in circumference. The gross damage in this community from hail, rain, and wind will amount to about $600 or $800.

Vida and White City, Autauga County, Ala.—Report of Mr. Claude B. Smith, Prattville, Ala.: The storm occurred about 5:00 p. m., November 14. The hail was extraordinary; one stone weighed 7 ounces. No material damage was done to property, except a few minor roofs were blown off and damaged by hailstones. Some live stock and poultry were injured.

Montgomery, Montgomery County, Ala.—Weather Bureau: Thunder was heard at Montgomery at 4:20 p. m. and again at 9:45 p. m. Rain began at 5:42 p. m. and continued at intervals until after midnight; 2.69 inches of rain fell from 5:42 p. m. to 11:00 p. m. Hail fell from 6:00 p. m. to 6:04 p. m., and again from 10:10 p. m. to 10:15 p. m. The hailstones in both instances were about the size of peas. No damage was done and hail melted soon after it fell.

The thunder and hail conditions began in the northwestern portion of the area between 2:00 p. m. and 4:00 p. m., and extended to the southeastern portion by 7:00 p. m., November 14.

GREAT RAINSTORM AT MOUNT WILSON, CALIF., DEC. 17-21, 1921.

By WENDELL P. HOGE, Special Observer

[Mt. Wilson, Calif., Jan. 10, 1922.]

The biggest rainstorm that has occurred at Mount Wilson, Calif. (elevation 5,704 feet) since rainfall observations were begun nearly 18 years ago, was recorded during the latter part of December 1921. Rain began falling at 6:40 p. m. December 17 and continued with but one interruption of 60 minutes, until 8:40 a. m. December 21, giving a total precipitation for the period of 21.88 inches. Beginning again at 2:00 a. m., the 22d, 1.15 inches was recorded up to noon the 23d.

What was apparently a second storm began with snow about 2:00 a. m. the 25th, turned to rain shortly after and continued without interruption until 4:40 p. m. the 27th, adding 6.35 inches, making a grand total for the 9 days and 22 hours of 29.38 inches.

The heaviest continuous downpour occurred from 3:00 a. m. to 3:00 p. m. the 19th, during which time 8.50 inches was recorded. The greatest amount for 1 hour was 1.25 inches, 9:10 to 10:10 a. m. the 19th. At 8:45 a. m. the 19th rain fell for 8 minutes at the rate of 2.40 inches per hour.

A standard 8-inch rain-gauge collector rests on the roof of a low one-story building, which is located within a few feet of the summit of the mountain, and near the edge of a very steep slope running off toward the south. A copper pipe leads from the collector down to a Marvin automatic recorder in the room below. A 16-candle electric lamp is placed under the collector on the roof, and the current turned on when snow falls. This gives enough heat to melt the snow, thus making a continuous record. Four and one-half inches of snow fell during the storm, which was all melted from the ground before the rain ceased.